Reconstruction of an orthographic system: The Linear B syllabary of Bronze Age Greece

Ester Salgarella

1 Writing in Bronze Age Greece: Linear B in context

A number of writing systems are witnessed to have been in use in Bronze Age Greece, having had as their cradle the island of Crete, situated in the middle of the Aegean sea at a crossroad between Europe, Egypt and the Levant. From a typological perspective, all these writing systems are syllabaries, meaning that each graphic sign represents a syllable (e.g. /pa/, /ri/, /e/) and is a phonological unit in the script. These syllabaries were also complemented with a set of logographic signs, depicting real-world referents and standing for words or concepts, not individual syllables. Crete first saw the rise of Cretan Hieroglyphic and the Linear A script: the former is understood to be a north/east Cretan phenomenon (with major find-spots at Knossos, Mallia and Petras) in use in the period ca. 1900-1700 BCE; the latter, with its original nucleus probably to be sought in central Crete (Phaistos), shows a much wider geographical distribution (across Crete, on the Aegean islands, some finds also in Asia Minor) as well as time-span, ca. 1800-1450. Both scripts are still undeciphered and are understood to encode the indigenous language(s) of Bronze Age Crete (on Linear A see esp. Schoep, 2002; Davis, 2014; Salgarella, in press; on Cretan Hieroglyphic see esp. Olivier and Godart, 1996; Ferrara, 2015; Decorte, 2017, 2018).

The role played by Linear A, and the civilisation responsible for creating and making use of such writing – the so-called 'Minoans' in the literature – cannot be over-estimated, so much so that over time Linear A was taken as a template (mother-script) for the creation of another two writing systems: Linear B, used on Crete and Mainland Greece in the period ca. 1400-1190 BC; and Cypro-Minoan, developed on Cyprus and used in the period ca. 1600-1050 (on Linear B see esp.: Ventris and Chadwick, 1973; Palmer, 1963; Hooker, 1980; Bernabé and Luján, 2006; Duhoux and Morpurgo-Davies, 2008, 2011, 2014; Melena, 2014c; Del Freo and Perna, 2019; on Cypriot scripts see esp. Steele, 2013a-b, 2019). Both daughter-scripts render different languages from the template: Linear B was successfully deciphered in 1952 and proven to write an archaic form of Greek named 'Mycenaean', while Cypro-Minoan is still undeciphered and encodes a language which is yet to be fully understood. In this chapter, the focus is on Linear B, since, being the only system currently deciphered and of which we thus have a better appreciation, it gives us the most insights into its diachronic development (starting from the process of adaptation from Linear A) and the reconstruction of the orthographic conventions used to write Greek by means of such system back in the Bronze Age.

For the purposes of this brief introduction, it needs stressing that the context of use of Linear B is restricted, as limited to the bookkeeping of bureaucratic transactions by palatial administrations: our evidence consists in inscribed clay tablets (and some vessels) which have been baked and thus preserved to us as a result of a number of firing episodes

which took place at the end of the Bronze Age. Therefore, due to the economic nature of the evidence, Linear B texts show a highly formulaic structure.

2 The ancestry of the syllabary

The first time Greek speakers set out to write down their language they made use of syllabic signs, since Linear B was moulded and adapted from the writing system already in use on Crete, namely Linear A. Hence, scholars have long been working on reconstructing the process and circumstances of adaptation and script transmission from one system onto the other. Upon discovery of the very first inscribed documents at the start of the 20th century, the British archaeologist Sir Arthur Evans, who was then excavating the palatial centre of Knossos on Crete (first excavations' report in Evans 1901), coined and used the unifying label 'Minoan linear scripts' to refer to such writing, further subdivided into scripts of 'Class A' and 'Class B' (with a chronological connotation). Since very early on, in fact, it was apparent that a good number of signs were shared between the two systems as appearing in both (and therefore listed with the prefix 'AB' in the systematised sign list), implying that upon adaptation these signs had been directly borrowed from the template. Some of these shared signs are likely to have retained both the same shape and the same (or approximately comparable) phonetic value and are therefore standardly referred to as 'homomorphic and homophonic' signs; some other signs, instead, show a comparable sign form (homomorphic), but their correspondence in terms of phonetic value cannot be uncontroversially proved (lastly Steele and Meissner, 2017). For this reason, and thanks to the decipherment of Linear B as Greek (see § 3) allowing for the phonetic interpretation of the syllabic signs, it is possible to at least read with an approximation the texts written in Linear A. On top of this core of 'shared' signs continued form Linear A to Linear B, some 12 signs were also created *ex novo* in Linear B (see § 7).

From a typological perspective, a syllabary is often deemed not to be the perfect fit for rendering Greek in writing: the syllabic structure of the Linear B system, which only encodes open syllables (i.e. syllables ending in a vowel), does not allow for the straightforward notation of final consonants (i.e. consonants in the coda of a syllable) and consonantal clusters, at times resulting in causing ambiguity as to the correct reading and interpretation of words (see § 4).[1] This is the reason why, in the mainstream scholarship, Linear B is often referred to as being an 'unsuitable' system. However, it has to be acknowledged that in the Late Bronze Age the (logo-)syllabic system was the best (if not the only) game in town in the Aegean area. Given the derivation of Linear B from Linear A, it is a reasonable assumption that the form of the syllabary may well reflect the characteristics of another language (Minoan), for which it was created, and not Greek. It may not be too far-fetched, in fact, to suppose that in the context of adaptation the first Mycenaean-Greek writers may well have retained not only the script in its purely graphic

[1] In this respect, an interesting comparison could be drawn with the closely related Cypriot syllabic system of the 1st Millennium BCE, which, although retaining the open-syllable structure to write Greek, developed quite different orthographic conventions (e.g. more extensive writing of final consonants *-s* and *-n*, and of consonantal clusters). For Cypriot writing see esp. Steele, 2013a.

form (i.e. the sign repertory), but also the orthographic conventions which were bound to it in the template system. This, in fact, would have been the most effortless solution for individuals who had to learn the writing technology *ex novo*, as well as how to notate their own – different – language in writing.

In this respect, the possibility may be entertained that the first writers of Linear B might have been bilinguals, mastering both Mycenaean Greek and Minoan (lastly Salgarella, in press), given the rather systematic regularity of spellings and the observance of orthographic conventions since the very early stage of Linear B writing documented to us (namely, the archive of the *Room of the Chariot Tablets* at Knossos, datable to ca. 1400-1390 BCE). This could explain, at least in part, why the system was not adapted to reflect more accurately and explicitly the phonological repertory of the Greek language (e.g. voicing and aspiration – discussed later on). What is remarkable is that, all in all, the extant Linear B texts present a notable orthographic uniformity, both across time (some 200 years of use of the system) and space (Crete and Mainland Greece). However, this is not to say that the system was completely standardised, as modifications, additions and local as well as chronological writing preferences can be observed nevertheless (see § 7; on the possible existence of 'local scripts' within Linear B see: Melena, 2014c: 84; Del Freo and Perna, 2019: 137-138).

3 Reconstructing orthographic conventions

At this point we may well wonder: how did we arrive at reconstructing the orthographic conventions used to write Mycenaean Greek with the Linear B writing system? Regrettably, we do not have any contemporary records nor accounts of writing conventions (if handbooks ever existed, these have not survived), and it was down to modern philologists to reconstruct the conventions that, it is believed, scribes followed when reducing the spoken language to syllabic writing. The reconstruction of orthographic conventions can be seen as a step-by-step process, which stretches from pre-decipherment to post-decipherment. In short, we could say that the method followed for the reconstruction was three-fold. The first step involved looking for general recurrent patterns, and this was done before the decipherment by scholars working on the then still called 'Minoan scripts', i.e. both Linear A and Linear B. To start with, Arthur Evans was already able to identify the presence of gender distinction (masculine and feminine) inferable from the juxtaposition of self-evident logograms depicting a man or a woman to words showing different endings (among which, for example, the signs later to be read as *jo*, masculine ending, and *ja*, feminine ending). On this wave, the American scholar Alice Kober demonstrated the existence of not just two, but three grammatical cases, and showed proof for inflection by collecting sets of words containing sequences of the same signs, but ending with different terminations: these are the so-called 'Kober's triplets' (for a description of the Linear B decipherment process and all the individual contributions see esp: Chadwick, 1967; Pope, 2008; Judson, 2017b).

As a second step, building on Kober's results and on a further search for systematic patterns, Michael Ventris carried out a methodical analysis of sign frequency and position. By using a combinatory method, he arrived at establishing relative links between signs,

resulting in a 'Grid' in which each row included signs likely to share the same consonant, and each column signs likely to share the same vowel (although at this stage phonetic values had yet to be suggested). Variation in spelling also played a role in the construction of the 'Grid': if two words differed by one sign only, by implication the two variant signs had to have something in common (either the same consonant or the same vowel). One such example is the word later to be transcribed as *a-re-pa-zo-o*, which also comes in the alternative spelling *a-re-po-zo-o*: although Ventris could not read it yet, he was able to list the two variant signs (*pa* and *po*) in the same row, as arguably sharing the same consonant. The 'Grid' was then tested against the texts.

At this point, Ventris made an educated guess by looking for the place name Amnisos (the harbor of Knossos) on the tablets, as he thought that place-names were likely to have been recorded and the 'Grid' already offered suggestions to read some signs as *a*, *n*+vowel, consonant+*i*. Fortunately, one of Kober's triplets showed exactly the desired pattern: *a*-**i*-*n**-**, easily to be restored as *a-mi-ni-so.* By filling in the gaps with the new values and updating the 'Grid' accordingly, Ventris started to allocate phonetic values to signs and, by consequence, to tentatively work out the readings of further words. The result of this work was what he called an 'Experimental Vocabulary': a list of Linear B words for which plausible Greek counterparts could be suggested, enabling him to demonstrate that the language encoded in Linear B showed enough features and vocabulary to be Greek. Ventris' decipherment was endorsed by Classicist John Chadwick, who, by testing Ventris' 'Grid' further, was able to read another number of Greek words not included in the 'Experimental Vocabulary'. The collaboration between the two resulted in firmly establishing the phonetic values of the core of the Linear B syllabary. Once this had been accomplished, the third final step to reconstruct orthographic conventions involved comparing the Linear B spellings with words known in alphabetic Greek on the one side, and their etymology in reconstructed Proto-Indo-European on the other. This allowed for a better and more nuanced appreciation of the readings, as well as the historical development of the Greek language.

As we can see, reconstructing orthographic conventions goes hand in hand with (and is a result of) the unfolding of the decipherment process: since the first stages of Ventris' analysis, it was reckoned that the words appearing on the Linear B documents, which started to sound quite like Greek, did show 'an unlikely set of spelling conventions' (Chadwick 1967: 67). Underneath this syllabic vest, the lexemes of Greek started to show themselves: the more words were given a Greek interpretation and read accordingly, the more the spelling conventions received confirmation. As Ventris himself announced on the BBC on 1st July 1952: 'I have come to the conclusion that the Knossos and Pylos tablets must, after all, be written in Greek – a difficult and archaic Greek, seeing that it is 500 years older than Homer and written in a rather abbreviated form, but Greek nevertheless. Once I made this assumption, most of the peculiarities of the language and spelling which had puzzled me seemed to find a logical explanation' (as quoted in Chadwick, 1967: 68; the full transcript has now been republished: Ventris, 1988).

By the end of the decipherment process, it was only a matter of systematising in a coherent way such conventions: these had first been put forward as the 'assumed rules of Mycenaean orthography' by Ventris and Chadwick in their after-decipherment technical

article ‘Evidence for Greek Dialect in the Mycenaean Archives’ (1953) and firmly established later on in the pivotal publication *Documents in Mycenaean Greek* (1956, followed by second edition in 1973). However, the uneasiness Chadwick and Ventris felt at reconstructing such ‘rules’ cannot be concealed and is on occasion expressed throughout their work: ‘these rules had been forced upon us as the result of identifying the Mycenaean words as Greek; they were in many respect unexpected and unwelcome; (…) although they were empirically determined, they do form a coherent pattern’ (Chadwick, 1967: 74); and ‘the inadequacy of the script led to considerable uncertainty about the exact form of many words, which could only be given intelligible shape by the assumption of certain rules of orthography. (…) These conventions are based on the general assumption that the pronunciation behind the spelling is a normal – though archaic – form of East Greek, such as had already been inferred for the period by philologists’ (Ventris and Chadwick, 1973: 67).

In the years that followed, scholars attempted to account for these complex (and at times rather puzzling) orthographic conventions in detail (see e.g. Palmer, 1963; Vilborg, 1960; Doria, 1965; Hooker, 1980; in more recent reference volumes see esp.: Bartoněk, 2003: 106-112; Risch and Hajnal, 2006: 45-55), and developed approaches aimed at understanding the *raison d’être* of such spelling strategies, with a focus on the systematic principles behind the spelling of consonantal clusters (for which see § 5). In this respect, two main currents of thought have been followed (summary in Woodard, 1997: 19-132; Bernabé and Luján, 2006: 45-52): one encompasses syllable-dependent approaches, hinged around the premise that orthographic conventions are dependent upon syllabic structure (Householder, 1964; Beekes, 1971; Sampson, 1985: 65-70; Ruijgh, 1985: 105-126; Morpurgo-Davies, 1987: 91-104); the other, by contrast, encompasses non-syllable-dependent approaches, based on the idea that such spelling representations are sensitive to a set of hierarchical relations (esp. sonority hierarchy), and not dependent upon syllabic structure (Tronsky, 1962; Woodard, 1994, 1997: 62-78, 112-132; Justeson, 1988; Viredaz, 1983).[2] To this latter group belongs the theory of the ‘hierarchy of orthographic strength’ elaborated by Roger Woodard (1994, 1997: 62-78, 112-132), which is worth mentioning as it stands out for not only giving an accurate account of the principles behind the spellings, but also managing to predict spelling outcomes (more on this in § 5).

In conclusion, Linear B writing conventions had first been established right after the decipherment and were refined over time by way of comparing Linear B spellings with the phonology of reconstructed Proto-Indo-European on the one side, and that of the later (1st millennium) alphabetic Greek dialects on the other. The very regularity of these orthographic ‘rules’ (although with some exceptions, discussed in § 6) implies that these conventions did exist. It remains to be demonstrated whether such conventions were created in the process of script adaptation to write Greek in the Linear B syllabic system, or were these continued, to some extent, from the previous system (Linear A) which, however, rendered a different language. In this Chapter, the focus is on the Linear B syllabary only

[2] Consani’s approach (2003, 2016) could also be taken as non-syllable-dependent, however he states that the writing of onsets and omission of codas of syllables and words would privilege the lexical access and semantic identification of lexemes, and therefore Linear B orthographic conventions were ‘a precise choice operated by the Linear B users and cannot be considered dependent on the nature of the writing system’ (2016: 96).

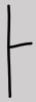
(not the whole logo-syllabic set) to suit the theme of the present volume, dedicated to historical orthography. Hence, in what follows an outline will be given of the main orthographic conventions ('rules') scholars have reconstructed for the orthography of the Linear B writing system. However, it has to be borne in mind that the Linear B sign repertory extends beyond its syllabic component (accounting for phonetic units) by also encompassing a set of logograms (i.e. picture-signs standing for real-word referents and commodities), a number of monograms (i.e. signs made up with all the individual signs, strongly interwoven, of the word they stand for), ligatures (i.e. combinations of logogram plus syllabogram), and measure signs (for exhaustive descriptions of the Linear B script and documents see works listed in § 1).

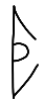
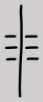
4 Writing Greek in syllables

With respect to syllabic structure, Linear B signs represent open syllables of the type (C)V (Consonant + Vowel, e.g. /da/; or Vowel alone, e.g. /a/). There are, however, some exceptions of signs with a CCV structure (Consonant + Consonant + Vowel), where the second consonant is either a labialized sound ([w], e.g. *dwo*, *nwa*, *twe*) or a palatalised sound ([j], e.g. *tja*, *rjo*, *rja*) (see § 6). The open syllable structure represents a structural constraint for writing Greek which has to be borne in mind since, as we will see, those responsible for 'standardising' the writing (orthographic) conventions upon adaptation of the Linear B script had to find ways of getting around the open syllable structure in order to account for consonants appearing in the coda of a syllable (a common feature in Greek, as an inflectional Indo-European language) as well as word-initial and word-internal consonantal clusters.

After the decipherment, scholars were able to arrange signs based on their phonetic value into 13 series (horizontal rows in **Table 1**): 12 consonantal series interlocking 5 vocalic sounds (*a*, *e*, *i*, *o*, *u*; vertical columns in **Table 1**). The entire syllabary, with a total of 87 signs, was subdivided into 'basic syllabary' and 'additional syllabary': the former comprises some 59 signs and represents the fundamental nucleus of the script, with the basic set of sounds necessary to write down any Greek word (although not unambiguously); the latter comprises some 14 signs which are either 'doublets' (this is the case when one single sign is used to replace the sequence of two signs already present in the basic syllabary: e.g. *au* to replace *a*-*u*), or 'complex' signs representing consonantal clusters (CCV) (discussed in § 6). On top of these, there are some 14 still undeciphered signs (discussed in § 8). In what follows, the main characteristics of the basic syllabary are outlined (in-depth description in Melena, 2014c: 26-53; Bernabé and Luján, 2006: 19-21, 23-26; Del Freo and Perna, 2019: 132-133).

Table 1: The Linear B 'basic' syllabary
(drawings by the author based on sign attestations on the extant documents)

	/a/	/e/	/i/	/o/	/u/
Vowel	 *a* /a/	 *e* /e/	 *i* /i/	 *o* /o/	 *u* /u/
d- /d/	 *da* /da/	 *de* /de/	 *di* /di/	 *do* /do/	 *du* /du/
j- /j/	 *ja* /ja/	 *je* /je/		 *jo* /jo/	
k- /k, g, kʰ/	 *ka* /ka, ga, kʰa/	 *ke* /ke, ge, kʰe/	 *ki* /ki, gi, kʰi/	 *ko* /ko, go, kʰo/	 *ku* /ku, gu, kʰu/
m- /m/	 *ma* /ma/	 *me* /me/	 *mi* /mi/	 *mo* /mo/	 *mu* /mu/
n- /n/	 *na* /na/	 *ne* /ne/	 *ni* /ni/	 *no* /no/	 *nu* /nu/
p-					

/p, b, pʰ/	 *pa* /pa, ba, pʰa/	 *pe* /pe, be, pʰe/	 *pi* /pi, bi, pʰi/	 *po* /po, bo, pʰo/	 *pu* /pu, bu, pʰu/
q- /kʷ, gʷ, kʷʰ/	 *qa* /kʷa, gʷa, kʷʰa/	 *qe* /kʷe, gʷe, kʷʰe/	 *qi* /kʷi, gʷi, kʷʰi/	 *qo* /kʷo, gʷo, kʷʰo/	
r- /r, l/	 *ra* /ra, la/	 *re* /re, le/	 *ri* /ri, li/	 *ro* /ro, lo/	 *ru* /ru, lu/
s- /s/	 *sa* /sa/	 *se* /se/	 *si* /si/	 *so* /so/	 *su* /su/
t- /t, tʰ/	 *ta* /ta, tʰa/	 *te* /te, tʰe/	 *ti* /ti, tʰi/	 *to* /to, tʰo/	 *tu* /tu, tʰu/
w- /w/	 *wa* /wa/	 *we* /we/	 *wi* /wi/	 *wo* /wo/	
z /z/	 *za* /za/	 *ze* /ze/		 *zo* /zo/	

The 12 consonantal series of the basic syllabary comprise stops (d-, k-, p-, t-), nasals (m-, n-), liquids (l-/r-), sibilant (s-), labial approximant (w-), palatal approximant (j-), labio-velar (q-),[3] and a z-series of still debated phonetic interpretation.[4] There is one vocalic series, with each grapheme standing for either a long or a short vowel. It can easily be noticed at first glance that the system, as it is, suffers from under-representation of phonemes. As to vowels, vowel length is not marked (e.g. the sign transliterated as *o* may represent either short /o/ or long /o:/, likewise the sign transliterated as *e* could be either short /e/ or long /e:/), neither is it the presence of (possible) initial aspiration (the script has no series for the aspirate /h/, except for sign *a2* rendering /ha/). As to consonants, voice and aspiration are not marked in the series rendering stops, nor are these marked in the labiovelar series, and there is one single series for the rendition of liquids (/l, r/), which is conventionally transcribed as r-series (hence, e.g., *ra* could be read as either /ra/ or /la/). Moreover, Linear B neither makes use of diacritics to mark the presence of accents or breathing, nor has it a way of marking geminated (double) consonants (e.g. *mi-to-we-sa* /miltowessa/ *μιλτοFεσσα 'painted red').

This 'minimum marking' is a crucial shortcoming of the system, thus not allowing for a straightforward phonetic (and phonemic) reading of Mycenaean Greek words. Hence, an adequate understanding of the contextual occurrences of words is often necessary for their correct interpretation and reconstruction. This shortcoming affects stops to a great extent, as the lack of differentiation between voiceless, voiced and aspirated stops results in having the graphemes of the p-series representing the phonemes /p, b, p_h/, and the graphemes of the k-series representing the phonemes /k, g, k_h/. Dental stops are the only exception, as in this case, in addition to the d-series (voiced /d/), the system has a dedicated t-series for marking voiceless /t/, and plausibly also aspirated /t_h/.

These characteristics, along with the Linear B orthographic conventions (illustrated in § 5) result in sometime 'obscuring' the exact phonological reality of the word concealed behind the spelling. As it is, in fact, in certain contexts the Linear B script may create ambiguity: e.g. the spelling *pa-te* could be interpreted as either /patēr/ (alph. Gk. πατήρ) 'father' or /pantes/ 'all' (alph. Gk. πάντες), and only a contextual analysis can provide us with the most suitable reconstruction. This brings us to the next section, illustrating the orthographic conventions as reconstructed.

5 Spelling 'rules'

Once confronted with the technology of writing, those responsible for adapting the writing system to the needs of the Greek language established (and, to an extent, likely inherited) a

[3] Labiovelars are velar stops co-articulated with a labial sounds (e.g. /k_w, g_w, k_{wh}/), which Mycenaean Greek inherited from Indo-European and rendered by means of the q-series. Mycenaean is unique among the Greek dialects in still preserving these sounds in writing, as they had already been lost by the time of alphabetic Greek (with the only exception of the Arcadian and Cypriot dialects; see esp. Woodard, 1997: 181).

[4] The z-series may represent affricates (/t_s, d_z/), evolved into different sounds variably rendered (e.g. -σσ/ττ-, -ζ-, -δδ-) in the Greek dialects of the 1st Millennium (Melena, 2014:52-53). It has also recently been suggested that the z-series could represent the outcome of the depalatalisation (or full palatalization) of former palatalised stops (Melena, 2014:15, 46-53).

number of writing conventions, also known in the scholarship as 'spelling rules' (most recent descriptions in Bernabé and Luján, 2006: 31-52; Melena, 2014c: 89-123; Del Freo and Perna, 2019: 140-146). We have already mentioned that the main feature of the Linear B syllabary is its open syllable structure (syllables of the (C)V or C(C)V type), and that this is a hindrance for the accurate rendering of Greek phonological and morphological features alike (as well as phonotactics). This is particularly true when it comes to writing down closed syllables (CVC type: e.g. consonants at word-end as case markers) and consonantal clusters (CCV type), which are abundant in the Greek language (e.g. ἄνθρωπος /antʰrōpos/ 'man'). This was a critical issue that had to be dealt with. In order to overcome it, Mycenaean Greek writers (also referred to as 'scribes' in the literature) mainly adopted two procedures. Let us illustrate these with some examples.

The first solution, most economic and easy, was to simply omit the 'extra' consonant appearing in the coda of a syllable: this always applies to consonants at word-end, and in case the consonant in the coda is one of the following: /l, r/ (liquid), /m, n/ (nasal), /s/ (sibilant). By reason of omission of a sound, this spelling is also referred to as 'partial spelling' (Woodard, 1997: 11). Thus, how would a word like χαλκός /kʰalkos/ 'bronze' be spelled out? Here the syllabification is *kʰal-kos*, showing a sequence of two closed syllables (CVC-CVC). Based on the rule outlined above, word-final /s/ is dropped, and /l/ in the word-internal cluster is dropped likewise because of its phonetic nature (liquid): hence, the resulting spelling is *ka-ko.* But what if the word-internal consonant is none of the above? In this case, the second procedure followed (a slightly more creative one) consisted in spelling out both consonants of the cluster, giving rise to two syllables sharing the same vocalic sound: this is the so-called 'empty vowel' (alternatively, 'dummy vowel'), as this vowel was not supposed to be pronounced (inasmuch as not present in the phonological word). One such example is the graphic rendering of the word χρυσός /kʰrusos/ 'gold', whose syllabification is *kʰru-sos* (CCV-CVC), showing a consonantal cluster (/kʰr/) at word-start. With the aid of an 'empty vowel', added right after the first consonant of the cluster, the resulting spelling is *ku-ru-so* (with word-final /s/ regularly omitted). Another such example is the spelling of the renown site of Knossos on Crete: the place name is rendered as Κνωσ(σ)ός /Knōs(s)os/ in alphabetic Greek (and has remained the same until nowadays), showing a word-initial consonantal cluster. In Linear B the term is written with an 'empty vowel', resulting in the spelling *ko-no-so*. The procedure employing the 'empty vowel' is used (rather systematically) for both word-initial and word-internal consonantal clusters starting with a stop (stop + stop; stop + /l, r, m, n/, sometimes also stop + /s/), and with the clusters /mn/ (e.g. Ἀμνισός /Amnisos/ 'Amnisos' = *A-mi-ni-so*) and /sm/ (see below). This alternative spelling strategy is also called 'plenary spelling', given that in this case all consonants are clearly spelled (Woodard, 1997: 11).

At this point, some observations need to be made on the spelling of /s/ in clusters, as its treatment is not systematic. We have already seen that word-final /s/ is always omitted. In word-initial and word-internal position, /s/ is normally omitted when starting a consonantal cluster comprising a stop (e.g. σπέρμον /spermon/ 'seed/grain' = *pe-mo*; φάσγανα /pʰasgana/ 'sword' = *pa-ka-na*; Fάστυ /wastu/ 'city' = *wa-tu*); however, /s/ is usually spelled out when the second consonant of the cluster is either /m/ (smV) or /w/ (swV) (e.g. δοσμός /dosmos/ 'contribution' = *do-so-mo*). As final remark, in addition to bi-

consonantal clusters, we can also find a few instances of tri-consonantal clusters: in this context the 'empty vowel' rule applies and all three consonants are spelled out with the aid of the 'empty vowel (e.g. the man name *a-re-ku-tu-ru-wo* /Alektruōn/).

In sum, the two strategies used to spell consonantal clusters are either partial spelling (omission of a sound) or plenary spelling (full rendition of both consonants). It would appear that these two strategies are not accidental, but compliant with the sonority hierarchy of consonantal sounds. Woodard (1994, 1997) has in fact demonstrated that these spellings respect what he calls the 'hierarchy of orthographic strength' (mentioned in § 3). This theory is based on the assumption that orthographic strength progressively decreases from stops to liquids, following the sequence: stop > fricative > nasal > glide > liquid. Thereby, Woodard (1997: 65) comes to the conclusion that: 'within a word, any two successive consonants will be represented with plenary spelling if, and only if, the orthographic strength of the first is greater or equal to that of the second; otherwise, partial spelling will be used'. This non-syllable-dependent approach gives an accurate and elegant explanation of the systematic procedures used to write consonantal clusters and is therefore worth bearing in mind for any further analysis of syllabic spelling.

Moving onto the next set of spelling rules, we shall now look at the treatment of vocalic sounds. As mentioned earlier, vowel length is not marked, neither is it initial aspiration. The script, in fact, does not have a sign series for aspirated vowels, the only exception being sign *a2* (a Linear B innovation) standing for /ha/, which is attested in word-initial, word-internal (at compound boundary) and word-final position (see esp. Pierini, 2014; Melena, 2014c: 73-78). The possibility may be entertained that some of the still undeciphered signs (listed in § 8) could potentially represent aspirated vocalic sounds, although no such cases have been clearly identified so far. Notwithstanding, there seems to have been ways of signaling the presence of intervocalic aspiration (although not explicitly marked): one of the methods used was the intentional omission of the so-called 'graphic glides'. 'Graphic glides' is the name conventionally given to transitional sounds [j] and [w] following a syllable ending in /i/ and /u/ respectively and preceding a following vocalic sound, in order to ease the phonetic transition between the two next-by vowels. The phonetic nature of glides is still problematic and it is unclear whether these are simply transitional sounds or actual subphonemic features (see esp. Meissner, 2008; Melena, 2014c: 23). For this reason, their name for now remains 'graphic' glides. Let us see the above rule in practice: the adjective *ko-no-si-jo* /Knōs(s)ios/ 'of Knossos' shows the glide [j] placed between the vocalic sounds /i/ and /o/, likewise the noun *ta-ra-nu-we* /tʰrānues/ 'footstools' (cf. alph. Greek θρῆνοι/θρόνοι) shows the glide [w] coming after /u/ and before /e/. The use of glides is reasonably consistent (with a few contextual exceptions: see Melena, 2014c: 116-117, 120-122; Del Freo and Perna, 2019: 142) and their absence generally points to the presence of intervocalic aspiration: e.g. the noun *a-ni-o-ko* /(h)anniʰokʰos/ 'reins holder / charioteer', and the personal name *wa-tu-o-ko* /wastuʰokʰos/.[5] Omission of glides in contexts where these would be expected is one way of marking intervocalic aspiration;

[5] Both nouns are compounds with *-o-ko* /hokʰos/ 'holder' (< *segʰ-; cf. alph. Greek ἔχω 'to have'). The first member of *a-ni-o-ko* is related to *a-ni-ja* /(h)anniai/ 'reins' (cf. alph. Greek ἡνίαι), while the first member of *wa-tu-o-ko* is *wa-tu* /wastu/ 'city'.

another way of marking it, in environments that would not have featured a glide anyway, is through the presence of the hiatus: the hiatus, expressed by writing two consecutive vocalic sounds, blocks vowel contraction, pointing to the presence of intervocalic /h/. We can see this phenomenon in instances such as: the neuter plural ending *-wo-a* /-woha/ of the perfect participle, which may also show the most accurate alternative spelling *-wo-a*$_2$ (e.g. *te-tu-ko-wo-a* alongside *te-tu-ko-wo-a*$_2$ /tetukʰwoha/ 'completely built'); the dative-locative plural case-endings *-a-i* (a-stems) and *-o-i* (o-stems) representing /-ahi/ and /-ohi/ respectively (e.g. *e-qe-ta-i* /hekʷetahi/ 'to the Followers').

We shall now move onto another case of sequences of vocalic sounds: diphthongs. Mycenaean Greek has /-i/ diphthongs and /-u/ diphthongs, but there are no separate and complete sign series for the notation of diphthongs in the script. Therefore, a set of conventions had to be devised for their rendering. With respect to /-i/ diphthongs, conventionally the second element (/i/) is not spelled out (with very few exceptions):[6] e.g. *po-me* /poimēn/ 'shepherd' (aph. Gk. ποιμήν), *ko-wa* /korwai/ 'girls' (aph. Gk. κόρ(F)αι, nominative plural). By contrast, in /-u/ diphthongs the second element (/u/) is always explicitly notated: e.g. *e-u-me-de* /eumēdēs/ 'Eumedes' (aph. Gk. Εὐμήδης), *na-u-do-mo* /naudomoi/ 'ship builders'. It has to be pointed out that Linear B does have 3 signs that represent diphthongs: *a*$_3$ /ai/, *a*$_4$ /au/, and *ra*$_3$ /rai, lai/. These all belong to the 'additional syllabary', which is discussed in the next section.

6 Breaking the 'rules'

The 'additional syllabary' (**Table 2**) consists of 14 signs which do not form complete series (in-depth discussion in Melena, 2014c: 53-82; Bernabé and Luján, 2006: 26-30; Del Freo and Perna, 2019: 133-134). These are conventionally subdivided into 'doublets' and 'complex syllabograms'. The former group comprises signs whose phonetic value is understood to be somewhat similar to that of signs belonging to the basic syllabary (hence the nomenclature 'doublets'). Classified as such are: *a*$_2$ /ha/, *a*$_3$ /ai/, *a*$_4$ /au/, *pu*$_2$ /pʰu, b$_{(h)}$u/, *ra*$_2$ /rja, lja/ (> /rra, lla/) and *ro*$_2$ /rjo, ljo/ (> /rro, llo/)[7], *ra*$_3$ /rai, lai/, *ta*$_2$ /staʔ/. Of these, 4 are Linear B innovations (*a*$_2$, *a*$_3$, *ro*$_2$, *ra*$_3$), while 4 (*au*, *pu*$_2$, *ra*$_2$, *ta*$_2$) have graphic antecedents in Linear A (shaded in **Table 2**). The latter group comprises signs of the CCV type, where the second consonant is either [w] (labialised) or [j] (yodised). To this group belong: *dwe* and *dwo*, *twe* and *two*, *pte* (< *pje*?), *nwa*. Except for the latter (*nwa*), which has a graphic antecedent in Linear A, these signs are all new introductions in Linear B (for a discussion of additional syllabary signs and their role in reconstructing the Linear A to Linear B script adaptation process see Judson, 2017a).

[6] These are mostly limited to Knossos: e.g. *pa-i-to* /pʰai(s)tos/ Φαιστός, the place-name Phaistos.
[7] Yodised consonantal clusters are understood to have undergone a process of palatalisation resulting in palatalised geminates.

Table 2: The 'additional syllabary' of Linear B
(drawings by the author based on sign attestations on the extant documents)

	a-series			***labialised group***			***yodised group***			***aspirated stop***
	aspiration	i-diphthong	u-diphthong	/Cwa/	/Cwe/	/Cwo/	/Cja/	/Cje/	/Cjo/	
a	 a2 /ha/	 a3 /ai/	 a4 /au/							
d-					 dwe /dwe/	 dwo /dwo/				
n-				 nwa /nwa/						
p-								 pte </pje/?		 pu2 /phu, bhu/
r-		 ra3 /rai, lai/					 ra2 /rja, lja/		 ro2 /rjo, rjo/	
t-					 twe /twe/	 two /two/	 ta2 /tja/			

It is worthwhile noting that additional syllabary signs are used for the rendition of specific phonological traits: e.g. aspiration, gemination, notation of diphthongs and of labialised and yodised clusters (CwV, CjV). The use of additional syllabary signs, however,

is not systematic, and seems to have been up to each individual writer to decide whether or not to make use of these signs instead of combinations of signs already available in the basic syllabary. Thanks to such spelling alternations it was thus possible to work out the phonetic value of most additional syllabary signs, which have been established through the joint effort of a number of scholars (*in primis* Meriggi, 1955; Palmer, 1955; Petruševski and Ilievski, 1958; Ephron, 1961; Lejeune, 1962; Chadwick, 1968). By way of example, the syllabogram *ra*$_2$ alternates with the digraph *-ri-ja* to represent the suffix /-tria/ (cf. alph. Gk. -τρια) of some feminine *nomina agentis* (e.g. *a-ke-ti-ra*$_2$ and *a-ke-ti-ri-ja* /askētriai/ 'weavers'), meaning that *ra*$_2$ was likely to represent the cluster /rja/. Using one sign instead of a sequence of two would have been a more economical choice for tablet writers.

There are other similar examples of variant spellings of the same word, with and without an additional syllabary sign: e.g. *pe-ru-si-nwa* alongside *pe-ru-si-nu-wa* (/perusinwa/ 'last year's', cf. alph. Gk. περυσινός), *pte-re-wa* alongside *pe-te-re-wa* (/ptelewa/ 'made of elm wood', cf. alph. Gk. πτελέα 'elm tree'), *o-da-twe-ta* alongside *o-da-tu-we-ta* and *te-mi-dwe-ta* alongside *te-mi-de-we-ta* (terms used to describe chariot wheels), *pa-we-a*$_2$ alongside *pa-we-a* (/pʰarweha/ 'clothes', cf. Hom. φάρε(h)α), *pe-ra*$_3$*-ko-ra-i-ja* alongside *pe-ra-a-ko-ra-i-jo* (the 'Further Province' in Pylos). Interestingly, in some instances spelling variation is also witnessed within the graphic repertory of one single scribe (e.g. scribe H 32 at Pylos). It was possible, therefore, for scribes to 'break the rules' and make use of alternative spellings, as long as these did not compromise the understanding of the underlying phonological word.

7 Scribal 'creativity': inconsistencies or scribal choices?

Overall, some 12 new signs were introduced in Linear B by the scribes, in both the basic and the additional syllabary (see esp. Melena, 2014c: 84-88). The basic syllabary was expanded with the addition of 7 o-series signs (*do*, *jo*, *mo*, *no*, *qo*, *so*, *wo*)[8] and one e-series sign (*pe*). The additional syllabary was expanded with 4 'doublets' (3 signs of the a-series *a*$_2$ /ha/, *a*$_3$ /ai/, *ra*$_3$ */rai, lai*/ and one of the o-series *ro*$_2$ /rjo, ljo/ > /rro, llo/) and all the new 'complex' syllabograms (except *nwa*). The fact that Linear B introduced a good many o-series signs has made some scholars argue that the template system, Linear A, and by implication the Minoan language, was a 3-vowel system (/a/, /i/, /u/) (esp. Palaima and Sikkenga, 1999; objections in Davis, 2014: 240-242; Melena, 2014c: 86; Meissner and Steele, 2017). The absence of *pe* in Linear A, which at least graphically has got a number of e-series signs also continued into Linear B, remains puzzling and yet to be convincingly explained.

As to the innovations in the additional syllabary, most of these signs were either introduced more clearly to express specific features or used in specific contexts. We have already mentioned that *a*$_2$ /ha/ is the only sign clearly marking aspiration and, given its most

[8] Some o-series signs have been tentatively argued to have a graphic antecedent in Linear A (Melena, 2014c: 85; for *wo* Salgarella, in press). However, the issue of whether o-series signs were inherited from Linear A or newly invented for Linear B is still much controversial.

occurrences in either word-initial or word-internal position starting the second element of a compound, it has been suggested that *a2* may have originated as a demarcative sign mainly used at word-start or as a marker for a compound boundary (Melena, 2014c: 74). Another sign created to suit a specific context is *ra3* /*rai, lai*/, as it was used at word-end to mark the nominative plural of feminine nouns. Moreover, *ra3* appears to be a Pylian creation: it is widely used at Pylos in such morphological contexts by a number of scribes (H 1, 2, 4, 21, 31), but is never attested elsewhere. However, this is not the only sign to have originated at Pylos (or at least to be limited to this site). In fact, also the complex syllabogram *two* is so far a one-off attestation used by Pylian scribe H 43 to write the man name *o-two-we-o* (in genitive singular). On the other hand, its counterpart *twe* is only attested at Knossos (and more widely employed), but never elsewhere. Whether this pattern of attestations is fortuitous and due to the partial state of preservation of the extant evidence or genuinely meaningful is a matter that remains to be ascertained.

What is interesting, however, is that the other two complex signs newly introduced in Linear B, namely *dwo* and *dwe*, show a comparable formation: these are labialised CCV signs belonging to the o-series and e-series. Moreover, we can be quite sure that *dwo* was a creation within Linear B. In fact, the shape of *dwo* is made of two mirroring *wo* signs, in other words 'a pair of *wo*'s': it has been argued (Risch, 1957: 32) that its graphic form is itself an indication that *dwo* was created on the basis of the Greek language, since the Greek word for the numeral 'two' is δύο /duo/, sounding quite like 'duo *wo*' > 'dwo'. In turn, *dwe* may well have originated from *dwo* by analogy. All in all, we may see here at play some sort of underlying tendency to create pairs in an attempt at systematising the new introductions. Moreover, it can easily be noted that most new signs belong to the vocalic series most innovated in the basic syllabary (i.e. the newly expanded e-/o-series), and some of these signs seem to have been created on the basis of the analogic principle. This is likely to have been the case for *ro2* /rjo, ljo/ > /rro, llo/, likely to have been created by analogy with inherited *ra2* /rja, lja/, given that we do not have any examples of alternative spelling *ro2* / *-ri-jo* (while we have the alternation *ra2* / *-ri-ja*). Hence, the possibility may be entertained that the same principle also operated for the creation of the newly introduced sign *a3*, representing the diphthong /ai/, by analogy with the inherited sign *a4*, noting its /-u/ diphthong counterpart /au/. A final note is worth adding in relation to *pte*, as this sign appears to stand out for not being part of any series, hence being somewhat isolated in the structure of the syllabary. It has been suggested (see lastly Melena, 2014c: 69-70) that its phonetic value /pte/ developed from an original /pje/ where the palatalised labial never underwent full palatalisation, but was replaced with the cluster /pt/ instead. Interestingly (and strangely enough given the assigned value), this sign is a Linear B innovation, not present in Linear A (or at least not found yet if it did exist), and is only used for the spelling of a limited number of words mainly at Knossos, Pylos and sporadically Tiryns.

By presenting and discussing the signs which were newly introduced in Linear B, this section has laid stress on the 'creativity' of the writers involved in the process of adapting the script to the Greek language. It has been shown that some creations were added to better account for Greek phonological features (e.g. aspiration), some others instead appear to be more restricted in both context of use and attestations (e.g. *ra3*). All in all, such examples are worth the title of 'scribal creativity'.

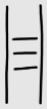
8 Filling the gaps & the undeciphered signs

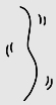
Looking back at **Tables 1-2**, some irregularities catch the eye: why are there still empty slots in the syllabic series? Some of these empty slots are to be expected for phonetic reasons and can therefore be taken as 'structural gaps': this is most likely the case for the slots showing the phonetic sequences /(C)wu/ (including *qu* = /kʷu/), and maybe also for the sequence /ji/ (although Melena, 2014a: 83, suggests a value /ji/ or /zi/ for the undeciphered sign *63; for a possible, however still speculative, reconstruction of the general structure of the Linear B syllabary see: Melena, 2014c: 88-89; Del Freo and Perna, 2019: 138-140). Other empty slots, instead, may simply reflect our still partial understanding of the Linear B syllabary in its full form and stand a chance to be filled with some of the undeciphered signs. By way of example, the values /ju/, /zi/, /zu/ are not implausible and would fill in some of the partially complete series, making it reasonable as well as justifiable to look for their presence among the still undeciphered signs.

In fact, although more than half a century has now gone by since the decipherment of Linear B, some 14 syllabograms (**Table 3**) are still enigmatic and remain untransliterated: hence called 'undeciphered', and conventionally referred to with their classification number preceded by an asterisk (see esp. summary in Del Freo and Perna, 2019: 134-135, with specific references; Judson, in press). Also in this case, some of these signs have been inherited and continued from Linear A (shaded slots in **Table 3**), while some others are only attested in Linear B. Most of the undeciphered signs are rarely used and usually occur to spell names of arguable non-Greek origin (e.g. a female name spelled **18-to-no* at Knossos). Moreover, a good number of these do not show a widespread geographical distribution, as their attestations (and therefore use) are limited to certain sites: for instance, signs **18*, **47* and **49* are only attested at Knossos; sign **63* only at Pylos and Thebes; signs **64*, **83*, **86* only at Knossos and Pylos.

Thanks to alternative spellings with signs of the basic syllabary as well as contextual analyses, some very speculative phonetic values have been advanced for a number of undeciphered signs. These have been put forward mainly by José Melena (2014c: 88-89) and are reported in **Table 3** (with further references to specific discussions). It needs stressing that, for the time being, all these tentative values must be taken with due caution, as most values are not officially endorsed by the *Mycenological Colloquia*, and the hypotheses that await confirmation need to be tested with further studies. In fact, as Judson (in press)'s thorough analysis of the undeciphered signs points out, at present we are at an *impasse*, as there is no way of uncontrovertibly prove any of the values attributable to these signs, with a very few exceptions. The only sign whose phonetic value can be more securely determined is **65* (Melena, 2014a), which is likely to be read as /ju/ because of some compelling spelling alternations (e.g. a place name variably spelled *ri-*65-no*, *ri-u-no*, *ri-jo-no*) and a possible etymological connection of the Linear B word *i-*65* (nominative) / *i-je-we* (dative) with the Greek word for 'son' (/ʰius/ > υἱός). In case this reading is unanimously accepted, sign **65* is likely soon to be moved to the basic syllabary to fill the slot *ju* /ju/.

Table 3: The ‘undeciphered’ syllabograms of Linear B
(drawings by the author based on sign attestations on the extant documents)

Sign	***Speculative value***
 *18	/sto/ ? (Melena, 1985:483, fn. 21)
 *19	*ru*$_{2}$? (Melena, in preparation)
 *22	*pi*$_{2}$ /$_{m}$bi, p$_{h}$i/ ? (Melena, 1987)
 *34/35	*a*$_{5}$ /$_{h}$ai/ ? (Melena, 2014b)
 *47	*i*$_{2}$? (Melena, in preparation)
 *49	-
 *56	*pa*$_{2}$ /$_{m}$ba, p$_{h}$a/ ? (Melena, 1987)
 *63	*zi* ? (Melena, 2014a)

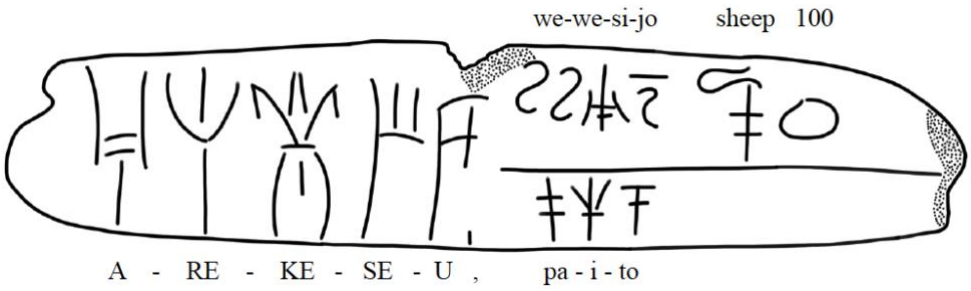
 *64	/swi/ ? (Chadwick, 1968) or /twi/? (Melena, in preparation)
 *65	*ju* /ju/ (Melena 2014a)
 *79	*wo2* /wjo/ (?) (Melena 1978)
 *82	/swa/ or /twa/ (?) (Melena, 1983: 262-7)
 *83	/nwe/ or /ste/ (?) (Melena 1985, in preparation)
 *86	/dwa/ (?) (Melena 1983)

9 Beyond signs: tablet layout

In addition to orthographic conventions, the documents inscribed in Linear B are characterised by a peculiar set of 'layouts' (i.e. modalities of disposing textual information on writing surface), which can be taken as some sort of *mise-en-page*. The purpose of this strategy appears to have been to enhance and ease legibility of the record as a whole for easier and quicker access to key information (e.g. place names, commodities listed, personnel involved) at first glance. As such, textual structure itself can be taken as carrier of information, as each item occupies a dedicated space. There are examples of 'capitalisation', where the first word of the record is written in bigger characters and stands out from the remaining text (usually by reason of its importance). One such example is given in **Figure 1**, where a man name (*a-re-ke-se-u* /Alekseus/) is written in 'capitals', followed

by the indication of a place name (*pa-i-to* ‘Phaistos’) in smaller characters on the second line (referring to the location), and the items (flock of sheep) recorded by means of logograms followed by numerals positioned at the far right end. This disposition arrangement places emphasis on the name of the individual (in this case a shepherd), in charge of the flock of sheep and its location, as well as pointing out the overall size of the flock (100 sheep): an easy and effective method.

Figure 1: Linear B tablet from Knossos (KN Da 1156)
(drawing by the author after *CoMIK* II: 43)



Change in character size is a strategy used to separate words, but not the only one. Two other methods were devised by the ‘scribes’ for marking word division: leaving a space between two consecutive words (as we do), or using a word-divider in the shape of a short, straight vertical line (represented by a comma in transliterations, as in **Figure 1**; on word-division see esp. Duhoux, 1999: 227-236; Melena, 2014c: 123-128; Del Freo and Perna, 2019: 146-147; Meissner, forthcoming). The latter method appears to have had an edge over the former, as it is the most frequently used (especially at Pylos), albeit not systematically. The word-divider is a new introduction in Linear B, as not present in Linear A. In some cases, we may even talk of scribal hypercorrection, as word-dividers are sometime placed (unnecessarily) between a word and a logogram, between logograms, or even between logograms and their related numerical entry. There are, however, some exceptions to the use of either methods: this is the case for formulae (nominal compounds) and clitic particles. Some words are in fact simply juxtaposed, without graphic separation: e.g. *a-ne-mo-i-je-re-ja* ‘priestess’ (*i-je-re-ja* /hiⱼereiⱼa/, alph. Gk. ἱερεία) ‘of the winds’ (*a-ne-mo* /anemōn/, alph. Gk. ἀνέμων, genitive plural), *pa-si-te-o-i* ‘to all’ (*pa-si* /pansi/, alph. Gk. πα(ν)σί) ‘the Gods’ (*te-o-i* /tʰehoihi/, alph. Gk. θέοισι, dative plural). As to clitics, these are usually attached to word-start or word-end: *o-u-di-do-si* /ou didonsi/ ‘they do not give’, with proclitic *o-u-* /ou/ ‘not’ (alph. Gk. οὐ) preceeding the verb; *e-ke-qe* /ekʰei kʷe/ ‘(s/he) has’, with enclitic *-qe* /kʷe/ (alph. Gk. τε) following the verb (on Mycenaean particles see Salgarella 2018, 2019a-b). As last remark, in Linear B there are no cases of *scriptio continua*, nor are words ever split across lines (which, instead, happens quite often in Linear A). Moreover, writing lines may at times be ruled to ease directionality of writing: this is also a new feature introduced in Linear B (only a few Linear A texts show ruling, which is never consistent throughout the document). In conclusion, Linear B documents show neater writing on tablet surface and appear to have improved on the *mise-en-page* for quicker information retrieval, resulting in an overall systematisation of the writing practice as a whole.

Bibliography

Bartoněk, Antonín 2003. *Handbuch des mykenischen Griechisch*. Heidelberg: Universitätsverlag C. Winter.

Beekes, Robert 1971. 'The writing of consonant groups in Mycenaean', *Mnemosyne* 24: 338-339.

Bernabé, Alberto, Luján, Eugenio R. 2006. *Introducción al griego micénico: Gramática, selección de textos y glosario.* Zaragoza: Prensas Universitarias de Zaragoza.

Chadwick, John 1967. *The Decipherment of Linear B.* Cambridge: Cambridge University Press.

1968. 'The group sw in Mycenaean', *Minos* 9: 62-65.

CoMIK = Chadwick, John, Godart, Louis, Killen, John T., Olivier, Jean-Pierre, Sacconi, Anna, Sakellarakis, Ioannis A. *Corpus of Mycenaean Inscriptions from Knossos, Volumes I-IV (1986-1998).* Cambridge/Roma: Cambridge University Press; Edizioni dell'Ateneo.

Consani, Carlo 2003. *Sillabe e sillabari fra competenza fonologica e pratica scrittoria.* Alessandria: Edizioni dell'Orso.

2016. 'In search of the "perfect fit" between speech and writing. The case of the Linear B writing', in Paola Cotticelli-Kurras, Alfredo Rizza (eds.), *Variation within and among Writing Systems. Concepts and Methods in the Analysis of Ancient Written Documents*. Wiesbaden: Reichert Verlag, pp. 89-104.

Davis, Brent 2014. *Minoan Stone Vessels with Linear A Inscriptions.* Leuven/Liege: Peeters.

Decorte, Roeland P.-J. E. 2017. 'Cretan "Hieroglyphic" and the nature of script', in Philippa M. Steele (ed.), *Understanding Relations Between Scripts: The Aegean Writing Systems.* Oxford/Philadelphia: Oxbow Books, pp. 33-56.

2018. 'The Origins of Bronze Age Aegean Writing: Linear A, Cretan Hieroglyphic and A New Proposed Pathway of Script Formation', in Silvia Ferrara, Miguel Valério (eds.), *Paths Into Script Formation in the Ancient Mediterranean*. *Studi Micenei ed Egeo-Anatolici, Nuova Serie, Supplemento 1*, pp. 13-50.

Del Freo, Maurizio, Perna, Massimo (eds.) 2019. *Manuale di epigrafia micenea. Introduzione allo studio dei testi in lineare b, Volumi 1-2*. Padova: Libreria Universitaria.

Doria, Mario 1965. *Avviamento allo studio del miceneo: struttura, problemi e testi*. Roma: Edizioni dell'Ateneo.

Duhoux, Yves 1999. ‘La séparation des mots en linéaire B’, in Sigfrid Deger-Jalkotzy, Stefan Hiller and Oswald Panagl (eds.), *Floreant Studia Mycenaea. Akten sed X. Internationalen Mykenologischen Colloquiums in Salzburg vom 1.-5. Mai 1995. Band II.* Wien: Verlag der Österreichischen Akademie der Wissenschaften, pp. 227-236.

Duhoux, Yves, Morpurgo-Davies, Anna (eds.) 2008. *A Companion to Linear B: Mycenaean Greek Texts and their World, Volume 1*. Leuven: Peeters.
2011. *A Companion to Linear B: Mycenaean Greek Texts and their World, Volume 2.* Leuven: Peeters.
2014. *A Companion to Linear B: Mycenaean Greek Texts and their World, Volume 3*. Louvain-la-Neuve/Walpole, MA: Peeters.

Ephron, H. D. 1961. ‘Mycenaean Greek: a lesson in cryptanalysis’, *Minos* 7: 63-100.

Evans, Arthur J. 1901. ‘Knossos: Summary Report of the Excavations in 1900. The Palace’, *The Annual of the British Schools at Athens* VI:3-70.

Ferrara, Silvia 2015. ‘The Beginnings of Writing on Crete: Theory and Context’, *BSA 110*: 27-49.

Hooker, John 1980. *Linear B: An introduction*. Bristol: Bristol Classical Press.

Householder, Fred W. 1964. ‘A morphophonemic question and a spelling rule’, in Emmett L. Bennett (ed.), *Mycenaean Studies: Proceedings of the Third International Colloquium for Mycenaean Studies Held at 'Wingspread,' 4-8 September 1961*. Madison: University of Wisconsin Press, pp. 71-76.

Judson, Anna P. in press. *The undeciphered signs of Linear B*. Cambridge: Cambridge University Press.
2017a. ‘Process of script adaptation and creation in Linear B: The evidence of the “extra” signs’, in Philippa M. Steele (ed.), *Understanding Relations Between Scripts: the Aegean Writing Systems*. Oxford/Philadelphia: Oxbow Books, pp. 111-126.
2017b. ‘The decipherment: people, process, challenges’, in Anastasia Christophilopoulou, Yannis Galanakis, James Grime (eds.), *Codebreakers & Groundbreakers (Fitzwilliam Museum, Cambridge, 2017: catalogue of exhibition held Oct 2017-Feb 2018)*. Cambridge: Charlesworth Press, pp.15-29

Justeson, J. 1988. Review of: Sampson, Geoffrey 1985. *Writing Systems: A Linguistic Introduction*. Stanford: Stanford University Press, in *Language* 64: 423.

Lejeune, Michael 1962. ‘Les signes TA$_2$ et TWO’, *Rev. Phil.* 36: 217-224.

Meissner, Torsten 2008. ‘Mycenaean Spelling’, in Anna Sacconi, Maurizio Del Freo, Louis Godart, Mario Negri (eds.), *Colloquium Romanum: atti del XII colloquio internazionale di micenologia, Roma, 20 - 25 febbraio 2006, Volume 2*. Pisa/Roma: Fabrizio Serra, pp. 507-519.

forthcoming. ‘Mycenaean word division’, in John T. Killen, Anna Morpurgo-Davies (eds.), *Documents in Mycenaean Greek, 3rd edition*. Cambridge: Cambridge University Press.

Meissner, Torsten, Steele, Philippa M. 2017. ‘Linear A and Linear B: Structural and contextual concerns’, in Marie-Louise Nosch, Hedvig Landenius Enegren (eds.), *Aegean Scripts. Proceedings of the 14th International Colloquium on Mycenaean Studies, Copenhagen, 2-5 September 2015, Volume I*. Roma: Edizioni dell’Ateneo, pp. 99-114.

Melena, José L. 1978. ‘En torno a la identification del silabograma *79 del silabario micénico’, in *Actas del V Congreso Espagñol de Estudios Clásicos*, pp. 751-757.

1983. ‘Notas de philologia micénica, III: El silabograma *86’, *Emerita* 51: 255-267.

1985. ‘Notas de philologia micénica, IV: El silabograma *83’, in *Serta Gratulatoria in Honorem Juan Régulo*, pp. 473-486.

1987. ‘On untranslitterated syllabograms *56 and *22’, in Petar Ilievski, Ljiljana Crepajac (eds.), *Tractata Mycenaea. Proceedings of the Eighth International Colloquium on Mycenaean Studies, Held in Ohrid (15-20 September 1985).* Skopje: Macedonian Academy of Sciences and Arts, pp. 203-232.

2014a. ‘Filling gaps in the basic Mycenaean syllabary’, in Alberto Bernabé, Eugenio R. Luján (eds.), *Donum Mycenologicum: Mycenaean Studies in Honour of Francisco Aura Jorro*. Louvain-la-Neuve/Walpole, MA: Peeters, pp. 75-85.

2014b. ‘Filling gaps in the Mycenaean Linear B additional syllabary: the case of syllabogram *34’, in A. Martínez Fernández, B. Ortega Villaro, H. Velasco López, H. Zamora Salamanca (eds.), *AGALMA Homenaje a Manuel García Teijeiro*. Valladolid: Editorial Universidad de Valladolid, pp. 207-226.

2014c. ‘Mycenaean writing’, in Yves Duhoux, Anna Morpurgo-Davies (eds.) 2014, *A Companion to Linear B: Mycenaean Greek Texts and their World, Volume 3*. Louvain-la-Neuve/Walpole, MA: Peeters, pp. 1-186.

in preparation. ‘On the structure of the Mycenaean Linear B syllabary. I. The untransliterated syllabograms. Preliminary report’.

Meriggi, Piero 1955. ‘I testi micenei in trascrizione’, *Athenaeum* 33: 64-92.

Morpurgo-Davies, Anna 1987. ‘Mycenaean and Greek syllabification’, in Petar Ilievski, Ljiljana Crepajac (eds.), *Tractata Mycenaea. Proceedings of the Eighth International Colloquium on Mycenaean Studies, Held in Ohrid (15-20 September 1985).* Skopje: Macedonian Academy of Sciences and Arts, pp. 91-103.

Olivier, Jean-Pierre, Godart, Louis (eds.) 1996. *Corpus Hieroglyphicarum Inscriptionum Cretae.* Paris: De Boccard.

Palaima, Thomas G., Sikkenga, Elizabeth 1999. 'Linear A > Linear B', in Philip P. Betancourt, Vassos Karageorghis, Robert Laffineur, Wolf-Dietrich Niemeier (eds.), *Meletemata: Studies in Aegean Archaeology Presented to Malcolm H. Wiener as He Enters His 65th Year, Volume II.* Liège/Austin: Histoire de l'art et archéologie de la Grèce antique, Université de Liege; Program in Aegean scripts and prehistory, University of Texas at Austin, pp. 599-608.

Palmer, Leonard R. 1955. 'Observations on the Linear B tablets from Mycenae', *BICS* 2: 36-45.

1963. *The interpretation of Mycenaean Greek texts*. Oxford: The Clarendon Press.

Petruševski, M. D., Ilievski, Petar H. 1958. 'The phonetic value of the Mycenaean syllabic sign *85', *Živa Antika* 8: 265-278.

Pierini, Rachele 2014. 'Ricerche sul segno 25 del sillabario miceneo', in Alberto Bernabé, Eugenio R. Luján (eds.), *Donum Mycenologicum: Mycenaean Studies in Honour of Francisco Aura Jorro.* Louvain-la-Neuve/Walpole: Peeters, pp. 105-137.

Pope, Maurice 2008. 'The Decipherment of Linear B', in Yves Duhoux, Anna Morpurgo Davies (eds.), *A Companion to Linear B: Mycenaean Greek Texts and their World, Volume 1*. Leuven: Peeters, pp. 1-23.

Risch, Ernst 1957. 'Mykenisch wo-wo ko-to-no', *Minos* 5: 28-34.

Risch, Ernst, Hajnal, Ivo 2006. *Grammatik des mykenischen Griechisch* (available online at: http://sprawi.at/de/content/mykenisches_griechisch).

Ruijgh, Cornelius 1985. 'Problèmes de philologie mycénienne', *Minos* 19: 105-167.

Salgarella, Ester 2018. 'Some thoughts on Mycenaean o-u-qe', in Anna Margherita Jasink, Maria Emanuela Alberti (eds.), *Akrothinia 2: Contributi di giovani ricercatori agli studi egei e ciprioti*. Firenze: Firenze University Press, pp. 249-257.

2019a. 'Non-connective behaviour of the particle -qe in the Linear B documents from Pylos', *Studi Micenei ed Egeo-Anatolici. Nuova Serie* 5: 71-84.

2019b. 'Form and function of clausal particles in the Mycenaean documents from Pylos', *Journal of Greek Linguistics* 19: 196-214.

in press. *Aegean Linear Script(s): rethinking the relationship between Linear A and Linear B.* Cambridge: Cambridge University Press.

Sampson, Geoffrey 1985. *Writing Systems: A Linguistic Introduction*. Stanford: Stanford

University Press.

Schoep, Ilse 2002. *The Administration of Neopalatial Crete. A Critical Assessment of the Linear A Tablets and their Role in the Administrative Process.* Salamanca: Ediciones Universidad de Salamanca.

Steele, Philippa M. 2013a. *Syllabic Writing on Cyprus and Its Context.* Cambridge: Cambridge University Press.

2013b. *A Linguistic History of Ancient Cyprus: The Non-Greek Languages, and their Relations with Greek, c. 1600-300 BC.* Cambridge: Cambridge University Press.

2019. *Writing and Society in Ancient Cyprus.* Cambridge: Cambridge University Press.

Steele, Philippa M., Meissner, Torsten 2017. 'From Linear B to Linear A: The problem of the backward projection of sound values', in Philippa M. Steele (ed.), *Understanding Relations Between Scripts: The Aegean Writing Systems.* Oxford/Philadelphia: Oxbow Books, pp. 93-110.

Tronsky, I. 1962, 'Slogovaja struktura drevnegrečeskogo jazyka i grečeskoe slogovoe pis'mo', *Drevnií mir: Sbornik stateí*: 620-626.

Ventris, Michael 1988 (Sacconi, Anna ed.). *Work Notes on Minoan Language Research and Other Unedited Papers*. Roma: Edizioni dell'Ateneo.

Ventris, Michael, Chadwick, John 1953. 'Evidence for Greek Dialect in the Mycenaean Archives', *Journal of Hellenic Studies* 73: 84-103.

1973. *Documents in Mycenaean Greek, 2nd edition,* Cambridge: Cambridge University Press.

Viredaz, Rémy 1983. 'La graphie des groupes de consonnes en mycénien et cypriote', *Minos* 18: 125-207.

Vilborg, Ebbe 1960. *A tentative grammar of Mycenaean Greek*. Goteborg: Almqvist & Wiksell.

Woodard, Roger D. 1994. 'On the Interaction of Greek Orthography and Phonology: Consonant Clusters in the Syllabic Scripts', in W. C. Watt (ed.), *Writing Systems and Cognition. Neuropsychology and Cognition, Vol 6*. Dordrecht: Springer, pp. 311-334.

1997. *Greek Writing from Knossos to Homer. A Linguistic Interpretation of the Origin of the Greek Alphabet and the Continuity of Ancient Greek Literacy*. Oxford: Oxford University Press.